

UNIVERSITI TEKNOLOGI MARA

**THE MECHANICAL AND THERMAL
PERFORMANCE OF CHICKEN EGGSHELL FILLED
UNSATURATED POLYESTER COMPOSITE**

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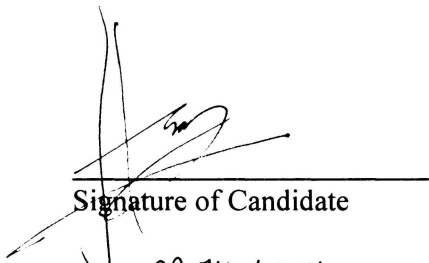
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ABSTRACT

The development of new polymer composite by incorporated chicken eggshell (Es) with thermosetting unsaturated polyester (PEs) was developed. Es is known to be one of waste material which being dumped into landfill. In Malaysia, 28k tonne per year of Es being dumped to the landfill and causes serious ground and underground water pollution. Es composed mainly of 94% of the most stable natural calcium carbonate (CaCO_3) in the form of calcite crystal. Calcite crystal was found to have higher density and crystallinity which expected to yield excellent mechanical performance when it used in the fabrication of chicken eggshell filled unsaturated polyester composite (EsPEs). On the other hand, calcite posse's high thermal degradation temperature in which it can sustain its original molecular structure at very high temperature. In this particular project, Es particulate were subdivided into three difference particulate sizes (more than 200 μm , in between 100-200 μm and less than 100 μm) and each of the particulate size would further divided into 30, 40, 50, 60, and 70 % of filler loading to be incorporated into PEs resin. The composite was fabricated using cold press machine in room temperature. The project flow involves material collection, washing and drying, material processing, sample fabrication and testing/analysis. The mechanical test such as tensile, flexural and drop weight impact test was conducted to EsPEs composites. Thermal test was also conducted to determine the k-value or thermal conductivity of the sample and further analyzed to determine samples' thermal performance. As for the physical test, density measurement and water absorption test were also conducted. The mechanical properties of EsPEs composite were determined by tensile, flexural and impact test. By increasing amount of Es filler loading, the tensile and flexural modulus of EsPEs increase due to nature of Es particulate which provide rigidity and stiffness to the composite. The smaller size of particulate used in fabrication of EsPEs composite yielded higher tensile and flexural modulus compared to larger Es particulate size due to evenly distribution of small Es particulate in the composite. As for the thermal performance, higher filler loading and smaller Es particulate size used in EsPEs fabrication lead to the decreasing k-value of the composite (good as thermal insulator). The density of EsPEs samples increase proportionally with increasing amount of Es filler and smaller Es particulate would resulted in higher density value of EsPEs composite. The ability of EsPEs composite to absorb water increased as the amount of Es loading increased. Larger particulate filler of Es would assist water absorption rate by providing countless micropores for water to easily penetrate the composite.

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TABLE OF CONTENTS

ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF PLATES	xiii
LIST OF ABBREVIATIONS OR NOMENCLATURE	xiv

CHAPTER 1: INTRODUCTION

1.1	Research Background	2
1.2	Problem Statement	4
1.3	Significant of study	5
1.4	Research Objectives	6

CHAPTER 2: LITERATURE REVIEW

2.1	The Nature of Composite Material	7
2.2	Chicken Eggshell (Es)	9
2.2.1	Chicken Eggshell as Bio-Filler to Polymer Composite	10
2.2.2	Composition of Chicken Eggshell	10
2.2.3	Physical and Chemical Properties of Chicken Eggshell	15
2.3	Polyester	18
2.3.1	Thermosetting Unsaturated Polyester (PEs)	19
2.3.2	Types of Thermosetting Unsaturated Polyester	20
2.3.3	Properties of Thermosetting Unsaturated Polyester	23
2.3.4	Chemical Reaction and Polymerization of Thermosetting Unsaturated Polyester	35
2.3.5	Toxicity and Precaution of Thermosetting Unsaturated Polyester	28
2.4	Methyl Ethyl Ketone Peroxide (MEKP)	29
2.4.1	Properties of MEKP	30
2.5	The Effect of Particulate Filler on Polymer Composite	31
2.6	Chicken Eggshell in Different Application	33